Information Technology for the Development of Public Administration

Part I. Theme I Analysis

In recent years, information technology has significantly influenced all aspects of human society. In particular, a new revolution in information technology represented by mobile internet, cloud computing, big data, and artificial intelligence is surging. In this process, new technological innovations have generated exponential growth of data in a variety of forms, which provides basis for more rational and efficient public decision-making. Meanwhile, social media and mobile internet have made participation in public decision-making more accessible to the people, and thus continuously promoted transparency, oversight and accountability in national governance. Information technology is transforming people's lives and has become an important tool for modernizing the governance system and capabilities of countries. It is an inevitable choice for public administration, as the core and most critical part of national governance, to rely on information technology to boost the modernization of services and enhance the ability to perceive, predict and manage risk factors.

In view of the development of the audit cause, the SAIs worldwide have undertaken increasingly important duties in strengthening accountability, promoting good governance, and monitoring the implementation of sustainable development goals in their respective countries. At the XXII Congress of the International Organization of Supreme Audit Institutions (INCOSAI) in 2016, Themes I was "How can INTOSAI contribute to the UN 2030 Agenda on Sustainable Development, including good governance and strengthening the fight against corruption?" In its *Strategic Plan 2017-2022*, INTOSAI mapped out a clear vision as "promote good governance by enabling SAIs to help their respective governments improve performance, enhance transparency, ensure accountability, maintain credibility, fight corruption, promote public trust, and foster the efficient and effective receipt and use of public resources for the benefit for their citizens". In the era of big data, SAIs have been aware of the importance of information technology to improve audit quality so as to help their respective countries implement their sustainable development strategies.

Although the role of information technology in public administration and the use of big data by SAIs are affected by the levels of economic development and IT application in different countries, the governments and their SAIs all set the promotion of information technology in public administration as one of their strategic goals. Based on such understanding, in November 2017, the 70th Meeting of the INTOSAI Governing Board endorsed "the role of information technology in promoting the development of public sector management" as Theme I of the XXIII INCOSAI, which was proposed by the Chamber of Accounts of the Russian Federation. The Theme is chaired by the National Audit Office of China and the Office of

Audit General of Canada is the vice chair.

There are two sub-themes under Theme I, namely, “data application in public administration” and “the role of big data analytics in the activities of SAIs”. This paper mainly covers the following: (1) the relationship between data and public administration; (2) the role of data application in public administration; (3) data applications for the improvement of public administration; (4) characteristics of big data auditing; (5) the role of big data analytics in the fulfillment of SAIs’ duties; and (6) the challenges faced by big data auditing and coping strategies of SAIs.

Part II. Sub-theme I: Data Application in Public Administration

2.1 Foreword

The use of information technology in public administration has evolved for years. Initially, office automation promoted the digitization of business processes, which was followed by the establishment of public administration IT systems, to enhance the data processing capabilities and efficiency of public administration; later, Internet was introduced to extend the public administration IT systems beyond government both technically and functionally. Centering on software and hardware, such uses mostly focused on self-control and self-management, generating mass data, the value of which was never fully tapped. Nonetheless, the advent of the big data era has led to the proliferation and diversification of data. Nowadays, data has become the core in the utilization of information technology in public administration, focusing on innovation and service optimization. It is mainly reflected in improvements in decision-making in public institutions, enhanced coordination among those institutions and the provision of more accurate services to the public, through comprehensive collection, integration, sharing, mining and analysis of data, in order to provide more efficient and transparent public administration.

2.2 Definition

Public administration under this sub-theme refers to the government-centered public sector, which integrates various social forces and extensively adopts political, economic, management, legal, and technical methods to strengthen the government’s governance capabilities and improve its performance and the quality of public services. Public administration is carried out in the public interest, with government departments and public organizations that take on public accountability as its subject, public assets, public resources, public projects and social issues as its object, and the pursuit of fairness and efficiency as its management goal.

2.3 Research Contents

2.3.1 Relationship between Data and Public Administration

Data is a basic strategic resource in public administration. From a global perspective, the trend is to use data to promote economic development, improve social governance, and enhance government services and regulation. Data based public administration can cope with complex social issues effectively, by utilizing data to support evidence based decisions, improve management and conduct researches, and thus it represents the inevitable direction of development for data as a basic strategic resource in public administration.

Data application is an essential means of optimizing public administration capabilities. Data can reflect objective social reality and public needs in a more accurate, comprehensive and timely manner. Accelerating the openness and sharing of government data, breaking information barriers and tapping the value of data will not only help make better use of information technology to perceive social trends, smooth communication channels, support decision-making, but also facilitate the building of a clean and transparent government, as well as improve the quality of public administration and public services.

2.3.2 The Role of Data Application in Public Administration

It is believed that data utilization aiming at improving the quality of public administration and public services can function in the following aspects:

a. More transparent public administration through data disclosure

With enhanced security and privacy protection according to law as a prerequisite, promoting openness of data resources in public institutions will help strengthen the oversight of public administration practices, increase transparency, and ensure standard, clean public administration practices, so that the public can fully enjoy the right to know, and credibility of public administration can be enhanced.

b. More effective departmental coordination through data sharing

Based on rational top-level design and overall planning, it is necessary to clearly define the scope and use of data-sharing in public institutions, clarify duties and rights in data management and sharing among various departments, and establish a platform for data sharing among regions, departments and government levels. The building of an interconnected, collaborative system with enhanced application can help improve the convenience and efficiency of the cooperation among public institutions.

c. Better decision-making through data analysis

Public institutions collect, integrate, analyze and utilize large volumes of scattered data from public institutions, industries and the society to support their decision-making. By doing so, they can take into full consideration various needs of social development, improve public administration methods and strengthen rational decision-making.

d. Better targeted public services through data integration

By collecting, integrating and analyzing data from multiple sources, public institutions can promptly understand the real needs and issues of concern of the public, and then take actions or deliver targeted services. They will be able to take into full account the public sentiment and opinion, effectively respond to public appeals, and improve public administration quality and citizens' satisfaction.

2.3.3 Data Application for the Improvement of Public Administration

Through analyses of data capacity building in various countries, we have taken stock of the measures to strengthen data utilization and improve public administration in three aspects of strategic planning, capacity development and implementation strategies.

a. Strategic Planning. Governments should promote overall planning for the data strategies at the national level, with clear goals, key application fields, management systems, and international cooperation mechanisms.

b. Capability development. Governments should

- improve infrastructure;
- collaborate with universities and research institutes to develop new technologies;
- increase investment and set up supporting funds; and
- attract and create incentives for personnel competent in technological innovations.

c. Implementation strategies. Governments should

- establish or designate an agency to promote big data application;
- improve policy measures for data disclosure, integration, and sharing;
- develop a data risk assessment mechanism, to identify the boundaries for data sharing and openness and set up an unified platform for open data;
- attach importance to data security and privacy protection;
- facilitate the effective use of publicly funded research findings and data; and
- develop a data utilization model based on collaboration among public institutions, private sectors, civil society organizations and citizens.

Currently, public institutions still face numerous problems in data disclosure, sharing, integration, analysis, application and security. In the process of fulfilling their duties, audit institutions may provide recommendations on data quality and data sharing in data collection and correlation. In addition, auditors can conduct performance audits of data application in the public sector, by assessing the effectiveness and risks.

Part III. Sub-theme II: The Role of Big Data Analytics in the Activities of SAIs

3.1 Foreword

For SAIs, conducting big data audits has become a necessity in response to the era of big data. In December 2015, when INTOSAI Knowledge Sharing Committee (KSC) conducted a survey among its members on research topics, 21 countries put forward 60 research projects, the topic 'Big Data' received the most attention, which was also the theme of a number of seminars held by various INTOSAI members and regional organizations. The INTOSAI Working Group on Big Data (WGBD) was formally established in December 2016, marking a milestone in the development of big data audit by SAIs. At its first meeting in Nanjing in April 2017, 49 participants from 18 SAIs shared their experience and understanding concerning opportunities and challenges in this respect. Although the SAIs face different internal and external environments as well as various levels of big data application, big data analytics is playing a varied but important role in improving audit efficiency and effectiveness and strengthening the performance of SAIs.

3.2 Definition

The big data audit under sub-theme II refers to the audit process characterized by

- multi-sourced mass data collection from the audited entities or the public;
- heterogeneous data integration; and
- intelligent data analysis.

Big data audit can improve audit quality and efficiency, and further enhance the role of SAIs in facilitating performance, transparency, and accountability, in order to attain good governance and sustainable development of the country.

3.3 Research Contents

3.3.1 Characteristics of Big Data Auditing

It is believed that big data in the auditing field includes structured, semi-structured, and unstructured data, the basic features of which are massive quantity and diversity. However, big data auditing is not just a matter of gathering mass data and using advanced techniques. It is a brand new embodiment of audit work under new circumstances and new requirements, and has a close bearing throughout on the complete and comprehensive exercise of the duties and responsibilities of SAIs. Based on the case studies collected from various SAIs, we have tentatively summarized the characteristics of big data auditing as 5M, i.e. Multi-source, Multi-perspective, Multi-relationship, Multi-technique and Multi-mode.

a. Multi-source: Big data audit departs from the collection of a single type of data from a few sources to

the extensive collection of financial data, operating data and management data from many audited entities, as well as open data on the internet. Inasmuch as big data analytics involves more fields with a broader range, it is the assembling of all types of data.

b. Multi-perspective: Big data audit provides a wealth of analytical perspectives. Not only it is possible to focus on institutional mechanisms, potential risks, policy effects and so on, it is also possible to dynamically depict the entire process of policy implementation, funds utilization and exercise of authority.

c. Multi-relationship: With diverse data relationships, big data audit involves different departments, fields, systems, government levels and regions. These data sources inter-relate with each other, making it easier to understand the real situations and resolve the problem of information asymmetry.

d. Multi-technique: Big data audit includes a series of new technologies and methods in data collection, storage and management as well as data mining and analysis. For data collection, in addition to Extract Transport and Load (ETL) tools, various new technologies, such as web crawlers, geographic remote sensing, and sensors are used; for data storage and management, the centralized structure is substituted by distributed structure (such as Hadoop, etc.); data mining and analysis have developed from simple statistics to intelligent and visualized methods.

e. Multi-mode: Big data audit can be on-site, off-site, or a combination of both. A variety of approaches such as centralized data collection, remote auditing, online auditing etc. can be used flexibly. Not only can it provide analysis results for on-site audits, big data analytics, through regular data updates, can also monitor major risk areas.

Those characteristics of big data audit can help SAIs evolve from audit sampling to the population, from audit parts to the whole, from micro to macro, and from ex post to concurrent and ex ante auditing.

3.3.2 The Role of Big Data Analytics in the Fulfillment of SAIs' Duties

Over the years, following the principles of the Lima, Mexican and Beijing Declarations, and within their respective mandates, the SAIs have played a key role in effectively improving the performance of the public sector, strengthening good governance, transparency and accountability, fighting corruption, and promoting sustainable development.

Today, the development of technology, economy and society has led to the exponential growth of data, and made data the basic strategic resource of each country. Obtaining access to data, analyzing data, and developing insights will continue to be an essential part of SAIs' work. Big data audit provides a new method to improve the quality and efficiency of audit.

a. Big data auditing helps break resource limitations, improve audit efficiency and expand audit coverage.

Under the constraints of human resources, budget and time, the SAIs have, for a long time, relied on audit sampling to infer the overall audit results. Subsequently it is difficult to expand the audit scope or increase sampling frequency. However, the use of big data provides new solutions for auditors. Through data mining and analysis, an intelligent, all-data audit model where “sample=population” has been made possible in some cases. The use of technology during auditing has proved effective to relax resource constraints.

Firstly, big data audit could conduct analyses before on-site audit and enhance the accuracy of on-site auditing, thereby shortening field work time. Secondly, big data audit could carry out regular monitoring, thereby to improve the quality of audit work.

b. Big data auditing helps improve SAIs’ ability to issue early warning about economic and social risks.

Big data audit is helpful to

- deliver more objective, reliable and timely information through data analysis;
- identify potential risks in the economy and society through predictive analysis; and
- provide recommendations to decision-makers in a wider scale through in-depth analysis.

c. Big data auditing helps broaden the horizon of SAIs, to promote sustainable development of the country.

In 2015, the United Nations adopted the 2030 Agenda for Sustainable Development, which defined 17 sustainable development goals. The SAIs, by following closely on the nation’s sustainable development strategies and relevant policy implementation, the allocation and use of public funds, and the exercise of public power, can facilitate the building of a transparent, clean and efficient government, promote good governance, and help realize sustainable economic and social development.

Big data audit follows the trace of the economic activities in digital circumstances, so that SAIs can evaluate the performance, transparency and accountability of the public sector in a more accurate and prompt manner, and ultimately facilitate the implementation of the United Nations 2030 Agenda for Sustainable Development.

3.3.3 Challenges Faced by Big Data Auditing and Coping Strategies of SAIs

After communicating with some SAIs, we realized that the practices of different SAIs’ use of information technology vary, especially big data analytics. Some SAIs mainly analyze financial data, some analyze operating and management data in a wider scale, while others have explored the integration of data from multiple fields.

Despite different national conditions, the challenges faced by SAIs are mainly manifested in two aspects.

In terms of external environment, SAIs usually face such challenges as the lack of legal authorization and the low level of digitization and big data industry; from a domestic perspective, they usually encounter a series of challenges in big data thinking, audit organization models, professional expertise and IT infrastructure. Especially, the lack of legal support and implementation measures pose major obstacles for SAIs to perform big data audit. That is to say, SAIs have no mandate for obtaining electronic data from audited entities or limited access to continuous and comprehensive data acquisition. The unavailability of data has become the prominent difficulty in the use of big data for SAIs. In response to these challenges, we propose the following:

a. Accelerate the promulgation or improvement of laws and regulations. Data should be recognized as an important resource in the information era. It should be stipulated explicitly that SAIs shall be empowered to obtain data from the audited entities. The obligation of audited entities to cooperate and the punishments for those who refuse to provide data or provide untruthful data should also be stipulated.

b. Develop long-, medium-, and short- term planning for big data audit. In light of the level of digitization, as well as the SAIs' mandates, the SAIs should take a long-term perspective with a firm grasp of the current situation and follow advanced big data technology.

c. Step up IT application in auditing. At present, IT application differs greatly among SAIs, which is closely linked to the performance of big data audit. It is suggested that, in light of SAIs' respective circumstances, IT application be strengthened step-by-step and that solid technical guarantees be provided for big data audit through data centers, analysis platforms, and innovations in data tools.

d. Strengthen the professional standards of auditors and upgrade audit organization and management. At present, big data expertise is generally lacking in SAIs. It is recommended that SAIs make greater efforts to enhance the overall competence of the audit team and ensure the capability of professionals. A big data analysis team or agency could be set up, to help transform audit organization from on-site audit to the combination of on-site audit and off-site data analysis.

e. Enhance regional and international cooperation. Information sharing and experience exchanges in the area of big data audit at the institutional, regional and INTOSAI level should be promoted. At the same time, SAIs should also learn from the practices of other stakeholders, especially other public sector institutions.

3.3.4 Outlook on INTOSAI's Responsibilities in Promoting Big Data Audit

As a professional organization advocating public sector auditing, INTOSAI should strengthen the sharing of big data auditing experiences. By strengthening bilateral and multilateral cooperation among the SAIs as well as coordination and cooperation with relevant international organizations, INTOSAI can summarize big data auditing experience and knowledge, develop relevant guidelines and research

reports, encourage SAIs to improve big data auditing, so as to promote the development of big data audit within the INTOSAI community.